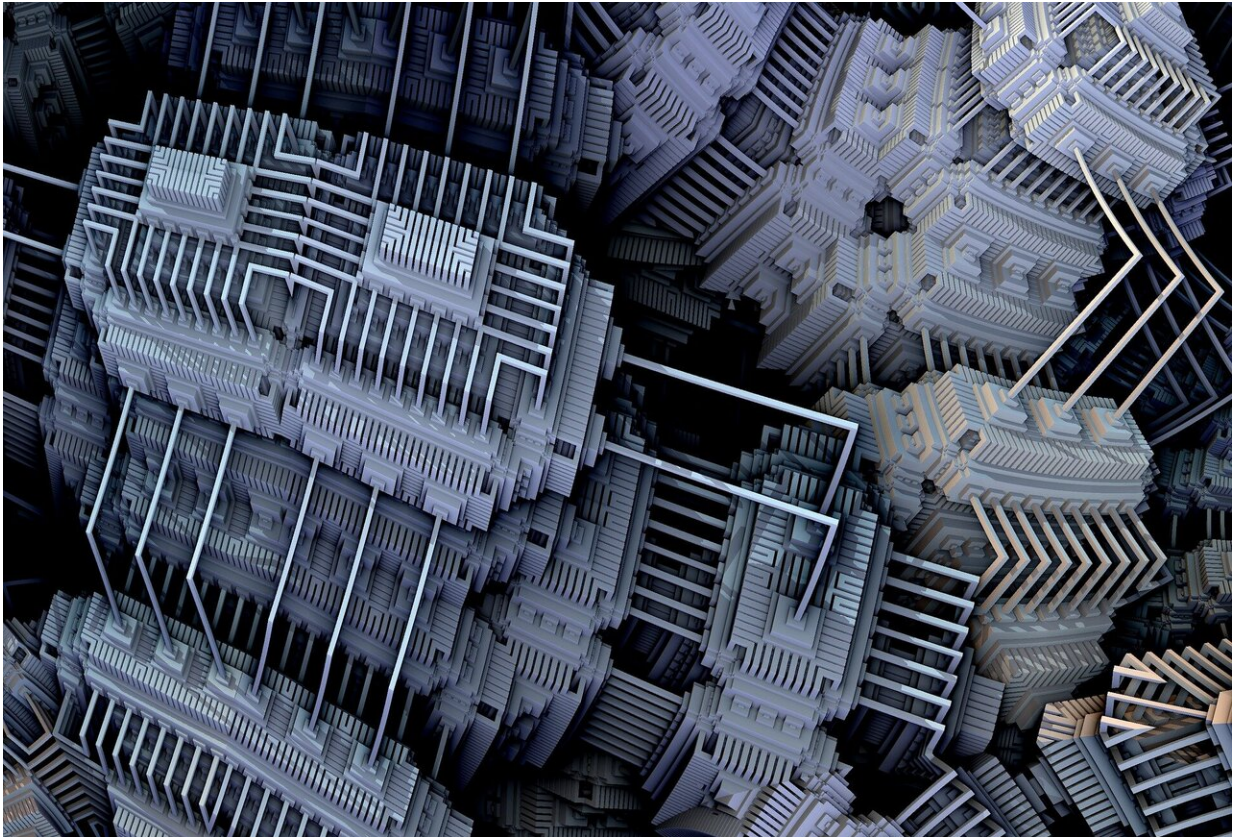


Improving quantum computers

April 17 2019



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For decades, experts have predicted that quantum computers will someday perform difficult tasks, such as simulating complex chemical systems, that can't be done by conventional computers. But so far, these machines haven't lived up to their potential because of error-prone

hardware. That's why scientists are working to improve the qubit—the basic hardware element of quantum computers, according to an article in *Chemical & Engineering News (C&EN)*, the weekly newsmagazine of the American Chemical Society.

Regular computers use bits to store data, which are represented as a "1" to indicate current flowing through a transistor or a "0" for no current. In contrast, qubits have a superposition of energy states—0, 1, or many places in between, which theoretically allows quantum computers to store and process much more information than a conventional computer. However, today's qubits are fragile and highly prone to errors caused by [environmental factors](#) such as vibrations or [temperature changes](#), Senior Correspondent Katherine Bourzac writes.

So far, scientists have proposed about 20 qubit designs, and there's no clear winner. However, today's leading technologies are based on superconducting circuits (which include an insulator sandwiched by metals that become superconductors at extremely low temperatures) and trapped ions (charged atoms suspended in a vacuum by electromagnetic fields). Researchers are working on better manufacturing processes and control equipment for these technologies. But they're also exploring [new materials](#) for [quantum computing](#), such as silicon spin devices and topological materials, that might reduce noise and error, allowing quantum computers to finally realize their potential.

More information: To upgrade quantum computers, researchers look to materials science, [cen.acs.org/materials/electron ... earchers-look/97/i15](http://cen.acs.org/materials/electron...earchers-look/97/i15)

Provided by American Chemical Society

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